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A new moderate-toothed croaker, *Johnius medidentatus* sp. nov. (Acanthuriformes, Sciaenidae) from the Indian Ocean

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Abstract

A new species, *Johnius medidentatus* **sp. nov.**, is described based on specimens collected from trawl and gill net landings along both the east and west coasts of India. The new species belongs to the subgenus *Johnieops* and can be distinguished from its close congeners, *Johnius borneensis* and *Johnius dussumieri*, by a combination of morphological characters, including an oval-shaped body (vs. oblong in the other two) and moderately sized, enlarged teeth in the inner row of lower jaw (vs. much enlarged and well differentiated in *J. borneensis*, and enlarged but weakly differentiated in *J. dussumieri*). It differs further from *J. borneensis* by the absence of much enlarged anterior teeth in the outer row of upper jaw (vs. present), snout rounded from dorsal view (vs. pointed), relatively shorter snout length (15.3–22.9% HL vs. 20.4–26.2% HL), higher modal number of total gill rakers (21 vs. 17). From *J. dussumieri*, it can be distinguished by a longer pre-anal length (68.5–73.5% SL vs. 59.8–69.9% SL) and larger eye diameter (21.8–30.1% HL vs. 15.7–22.4% HL). The new species can be easily distinguished from *J. plagiostoma* found in Indian waters in having first pair of mental pores in a false pit on the underside of the head (vs. separated by symphysis), absence of mental process on the lower jaw (vs. present), higher modal number of scales below the lateral line (12 vs. 10) and fewer modal number of total gill rakers (21 vs. 25). Mitochondrial COI gene analysis revealed over 8% divergence from its congeneric species. Maximum Likelihood phylogenetic analysis supports the distinctiveness of *J. medidentatus* **sp. nov.**, placing it in a well-supported clade closely related to *J. borneensis*.

Key Words

COI gene, India, *Johnieops*, new species, phylogeny, sciaenid

Introduction

The genus *Johnius* Bloch, 1793 of the family Sciaenidae comprises 33 recognized species worldwide (Hanafi et al. 2022; Fricke et al. 2025). In Indian waters, Lal Mohan (1981) provided a comprehensive account of sciaenids, documenting 36 species, including several synonyms. Among this, the genus *Johnius* constituted 11 valid species. Subsequently, Talwar (1995) recorded 12 species from India and adjacent waters, but did not mention *Johnius mannarensis* Lal Mohan, 1971, which is a valid species (Sasaki 1994). Instead, *Johnius sina* (Cuvier, 1830) was included as a valid species, which has since been synonymized with *J. dussumieri* (Sasaki 1999; Hanafi et al. 2023). Recent sampling along the Indian coastline confirmed the occurrence of *Johnius plagiostoma* (Bleeker, 1849), though previously reported from the Bay of Bengal region (Froese and Pauly 2024), there was no confirmed record from Indian waters (Lal Mohan 1981; Talwar 1995). Including this and other verified records, a total of 13 species are being recognized from Indian waters with 10 species belonging to subgenus *Johnius*, viz., *Johnius elongatus* Lal Mohan, 1976, *Johnius macrorhynus* (Lal Mohan, 1976), *Johnius macropterus* (Bleeker, 1853), *Johnius mannarensis* Lal Mohan, 1971, *Johnius amblycephalus* (Bleeker, 1855), *Johnius carutta*

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Bloch, 1793, *Johnius belangerii* (Cuvier, 1830), *Johnius carouna* (Cuvier, 1830), *Johnius coitor* (Hamilton, 1822) and *Johnius gangeticus* Talwar, 1991; and 3 species belonging to subgenus *Johnieops*, viz., *Johnius dussumieri* (Cuvier, 1830), *Johnius borneensis* (Bleeker, 1851) and *Johnius plagiostoma* (Bleeker, 1849) (Lal Mohan 1969, 1981; Talwar 1995). During the course of this sampling, a species of *Johnius* (*Johnieops*) different from other known Indian species was collected along with other sciaenids. This unknown specimen, after careful examination and comparison of all the known *Johnius* endemic to the Indo-Pacific region, represents a possibly undescribed species. Herein, we describe this new species of *Johnius* from Indian waters based on its morpho-meristic characteristics, with the support of molecular tools.

Materials and methods

Specimen collection & morphological studies

A total of four species, *J. borneensis* (*n* = 55), *J. plagiostoma* (*n* = 30), *J. dussumieri* (*n* = 44), and *J. medidentatus* sp. nov. (n = 52) were collected from different locations along both the west and east coasts of India (Fig. 1). The specimens were brought to the lab in an insulated box with ice, cleaned with water, photographed, and then morpho-meristic characters were recorded. The method of morphometric measurements and meristic counting followed Hubbs et al. (2004) and Sasaki and Kailola (1988) except for lower jaw length, where the length was taken from the tip of the lower jaw to the end of the maxillary bone. The standard length and head length are abbreviated as SL and HL, respectively. The morphometric distances were measured using a digital caliper to a precision of 0.01 mm. The otoliths were extracted by following the open and hatch method (Secor et al. 1992) and then stored in dry plastic vials after proper cleaning. The images of the otolith were captured using stereozoom microscope (Carl Zeiss, Stemi 508). The holotype was deposited in the Bombay Natural History Society (**BNHS**), Mumbai, paratype and non-type specimens were deposited in the ICAR Central Institute of Fisheries Education, Aquatic Biodiversity Museum & Repository (CIFE-ABMR), Mumbai, India, after preservation in 10% formalin.

Molecular study

A total of 15 individuals representing *Johnius medidentatus* sp. nov. (*n* = 8), *J. dussumieri* (*n* = 4), *J. plagiostoma* (*n* = 2), and *J. borneensis* (*n* = 1) were included in the molecular analysis, and these specimens were deposited as comparative material at ICAR CIFE-ABMR, Mumbai, India. A small portion of muscle tissue below the dorsal fin origin was incised and preserved in molecular-grade ethanol

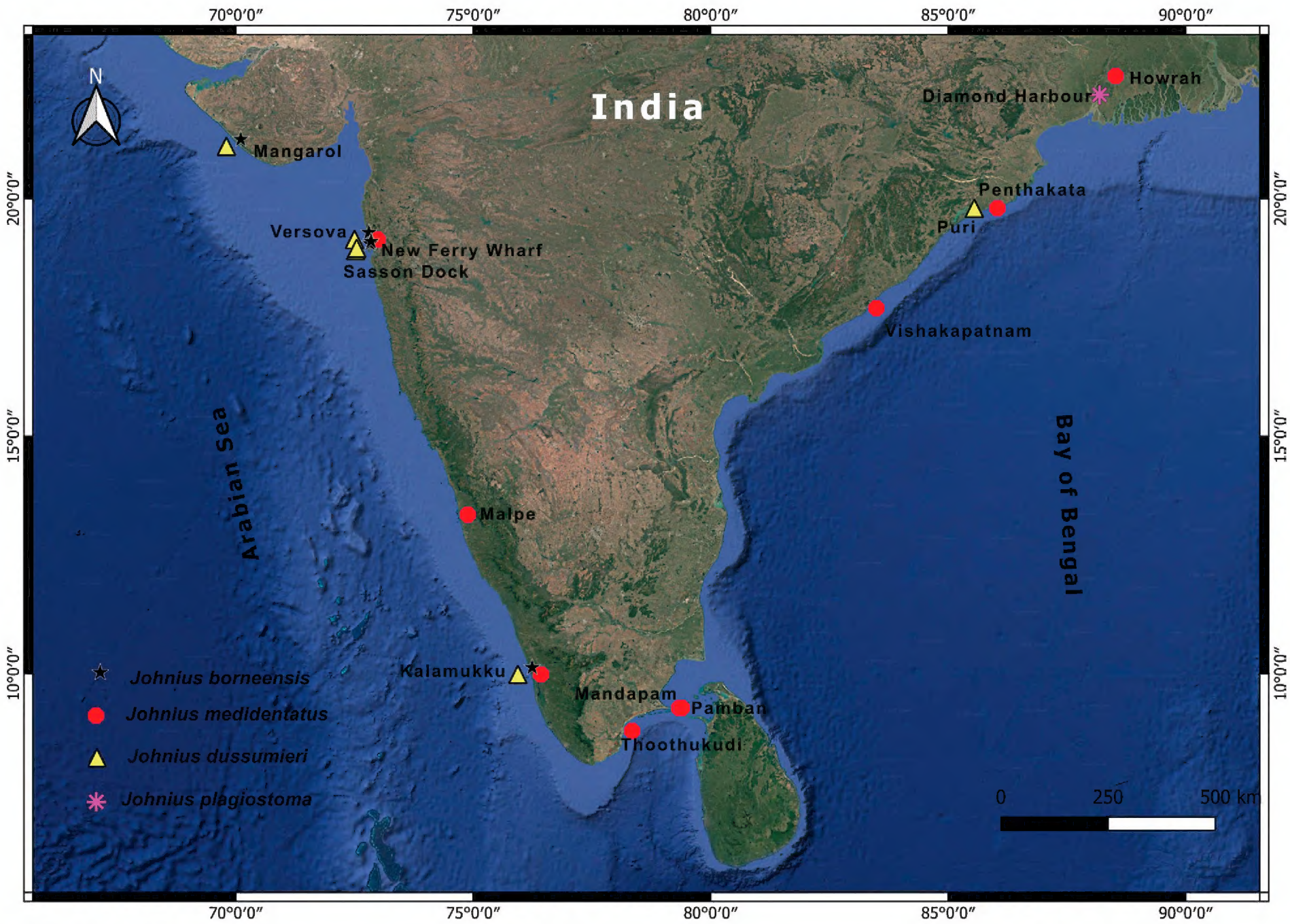

Figure 1. Map showing the sampling locations of the four species collected during the study.

for molecular analysis. DNA was extracted using a Qiagen DNeasy Blood & Tissue Extraction Kit following the protocol. The partial mitochondrial COI gene region (~650 bp) was amplified using primers given by Lo et al. (2017). PCR conditions followed were: initial denaturation (94 °C for 3 min), denaturation (94 °C for 1 min), annealing (51 °C for 45 seconds), extension (72 °C for 1 min) for 35 cycles and final extension (72 °C for 5 min) in 25 µl reaction mixture using Takara Emerald Amp® GT PCR Master Mix and later the PCR samples were purified and sequenced in both directions using ABI Genetic Analyzer. Only good quality sequences with Q value (Phred score > 30) were retained after trimming ambiguous regions at the sequence ends. The open reading frames (ORFs) of the COI sequences were then predicted using the NCBI ORF Finder. In addition to the sequences generated in this study, a supplementary dataset comprising available reported sequences of closely related *Johnius* (*Johnieops*) species was prepared by downloading sequences from the NCBI to estimate the interspecific genetic distance values. All sequences were aligned using Clustal W, integrated within MEGA11 (Tamura et al. 2021). Pairwise intra- and interspecific genetic distances were estimated using the Kimura-2-Parameter (K2P) model in MEGA11.

Phylogenetic analyses were conducted using IQ-TREE software (Trifinopoulos et al. 2016). The best fit substitution model was selected by ModelFinder based on the Bayesian Information Criterion (BIC). The chosen model was HKY+F+G4, where HKY refers to the Hasegawa-Kishino-Yano substitution model with empirical base frequencies (+F) and gamma-distributed rate variation among sites with four categories (+G4). *Lutjanus johnii* (Accession number KJ013051) was included in the analysis as an outgroup.

Branch support was assessed using ultrafast bootstrap approximation with 1000 replicates, and all branch lengths were estimated as part of the maximum likelihood search. The final tree was improved using Interactive tree of Life. All the sequence data generated during the study have been submitted to the NCBI GenBank database (Table 1).

Results

Johnius medidentatus Geenita, Pavan-Kumar, Bhushan, Devi & Jaiswar, sp. nov.

https://zoobank.org/E3177E7E-490B-4C3A-BF27-025F6533E92D

Figs 2a, b, c, 3, 4, 5d, 6c, Table 2

Proposed common name: Moderate-toothed croaker

Type material. ***Holotype.*** India • 1, 141 mm SL; Kalamukku Fishing Harbour, off Kerala coast, Arabian sea; 9°59.03'N, 76°14.56'E; 23 Dec. 2023; K. Geenita leg.; trawl landings; BNHS MF 77.

Paratypes. India • 2, 123–134 mm SL; same data as for holotype; CF1KL0123–CF1KL0124 • 2, 114–141 mm SL; same data as holotype; CF1KL0126–CF1KL0127.

Non-types. India • 3, 145–158 mm SL; Penthakata Beach, Puri, Odisha; 19°48.11'N, 85°51.00'E; 28 Mar. 2024; K. Geenita leg.; gill net landings; CF1OD0120–CF1OD0122 • 2, 93–95 mm SL; Mandapam Harbour, Tamil Nadu; 9°16.55'N, 79°09.07'E; 30 Aug. 2024; K. Geenita leg.; trawl net landings; CF1TN0118–CF1TN0119 • 1, 94 mm SL; Malpe Fishing Harbour, Karanataka; 13°20.91'N, 74°42.00'E; 20 Oct. 2024; K. Geenita leg.; trawl net landing; CF1KA0125.

Diagnosis. A species of *Johnius* (*Johnieops*) with the following combination of characters: body oval shaped; enlarged teeth in the inner row of lower jaw moderate in size; slightly longer pre-anal length, 68.5–73.5% SL; moderately large eye, 21.8–30.1% HL; scales below

Table 1. Details of the location, catalogue ID and GenBank accession numbers generated during the study.

Species	Place of collection	Specimen catalogue ID	GenBank Accession number	GenSeq Nomenclature
Johnius medidentatus **sp. nov.**	9°59.03'N, 76°14.56'E	CF1KL0123 (paratype)	PQ800493	genseq-2 COI
J. medidentatus	9°59.03'N, 76°14.56'E	CF1KL0124 (paratype)	PQ800494	genseq-2 COI
J. medidentatus	9°16.55'N, 79°09.07'E	CF1TN0118 (non-type specimen voucher)	PQ800488	genseq-4 COI
J. medidentatus	9°16.55'N, 79°09.07'E	CF1TN0119 (non-type specimen voucher)	PQ800489	genseq-4 COI
J. medidentatus	19°48.11'N, 85°51.00'E	CF1OD0120 (non-type specimen voucher)	PQ800490	genseq-4 COI
J. medidentatus	19°48.11'N, 85°51.00'E	CF1OD0121 (non-type specimen voucher)	PQ800491	genseq-4 COI
J. medidentatus	19°48.11'N, 85°51.00'E	CF1OD0122 (non-type specimen voucher)	PQ800492	genseq-4 COI
J. medidentatus	13°20.91'N, 74°42.00'E	CF1KA0125 (non-type specimen voucher)	PQ800495	genseq-4 COI
J. dussumieri	19°08.63'N, 72°48.23'E	CF1MH0097	PP938030	genseq-4 COI
J. dussumieri	19°59.09'N, 76°14.53'E	CF1KL0098	PP938031	genseq-4 COI
J. dussumieri	19°08.63'N, 72°48.23'E	CF1MH0099	PP938032	genseq-4 COI
J. dussumieri	19°08.63'N, 72°48.23'E	CF1MH0100	PP938033	genseq-4 COI
J. borneensis	18°57.42'N, 72°50.96'E	CF1MH0096	PP938040	genseq-4 COI
J. plagiostoma	22°11.39'N, 88°11.08'E	CF1WB0111	PQ489409	genseq-4 COI
J. plagiostoma	22°11.39'N, 88°11.08'E	CF1WB0112	PQ489410	genseq-4 COI

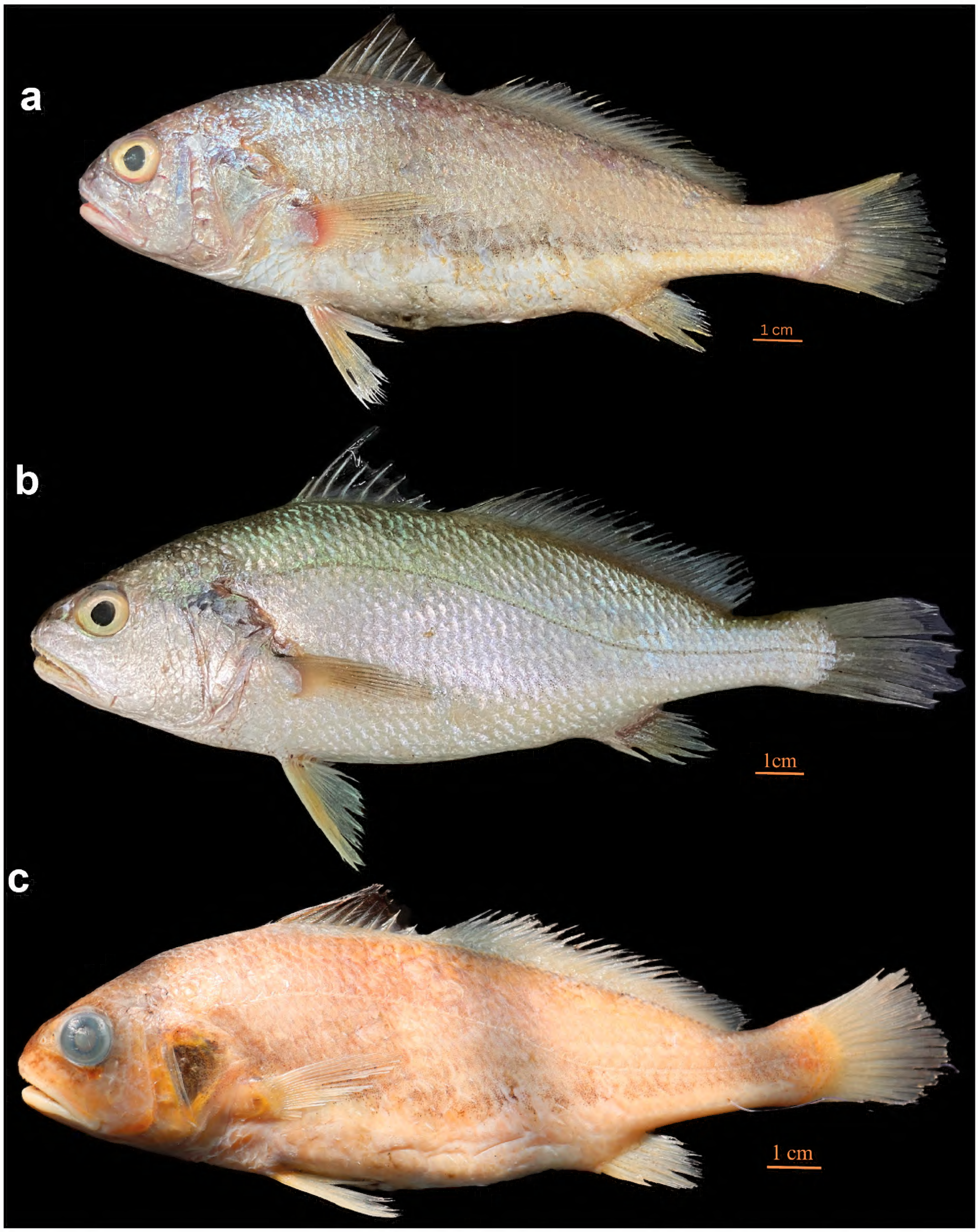

Figure 2 a. *Johnius medidentatus* sp. nov., holotype (141 mm SL) collected from Kerala; **b.** Non-type specimen collected from Odisha (153 mm SL); **c.** Preserved specimen of the holotype. Scale bar: 1 cm.

lateral line, 11–13 (mode 12); total number of outer gill rakers on first gill arch 5–8 (mode 7) + 10–15 (mode 13) = 17–24 (mode 21).

Description. Counts and measurements of the holotype and paratype with non-type specimens are presented in Table 2. For meristic counts, the modal values are given in brackets.

A small-sized fish with oval-shaped body, more or less compressed laterally, dorsal and ventral profiles evenly curved, nearly equal. Head moderate, 24.9–32.6% of SL,

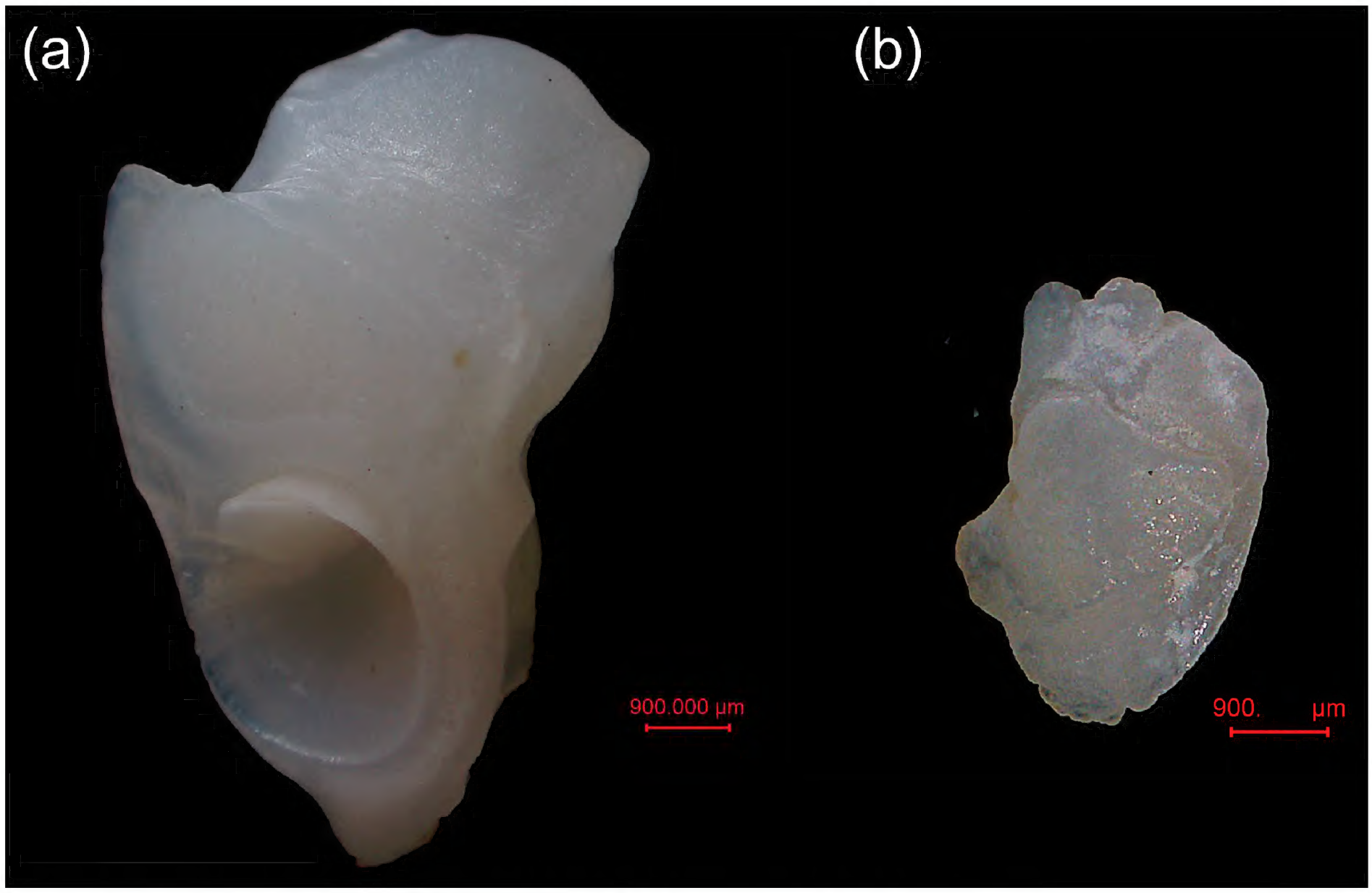

Figure 3. Inner surface of **a.** Left sagitta and **b.** Left lapillus of the new species. Scale bar: 900 µm.

Figure 4. Image showing swim bladder and its lateral appendages of *Johnius medidentatus* sp. nov. Scale bar: 1 cm.

with five rostral and five marginal pores, the skin around the latter forming weak lobes along its edge. Mental pore in three pairs, first pair lateral to tip of lower jaw but in "false pit". Snout evenly convex till origin of dorsal fin but never projecting. Jaws end equally at tips. Upper jaw, 43.6–54.7% of HL, and lower jaw, 40.6–52.8% of HL. Eyes round, moderately large, 21.8–30.1% of HL. Inter-orbital length moderate, 25.7–32.1% of HL. Mouth terminal. Upper jaw with spaced and enlarged teeth in outer row, teeth in inner row in 1–2 bands; lower jaw with moderately large and spaced teeth in inner row, small teeth in 1–2 rows in outer row, unregular teeth pattern at tip of lower jaw. Cleft of upper jaw extending till rear end of iris of eye. Pre-opercle finely serrated. Opercle with two flat spines near upper end. Pre-dorsal length, 26.2–31.2% of SL, pre-pectoral length, 27.2–31.7% of SL, pre-pelvic length, 27.6–34.6% of SL and pre-anal length, 68.5–73.5% of SL. Pectoral fin origin almost in vertical line of first dorsal fin insertion, its tip ending almost near 2nd–3rd soft dorsal fin ray. Anal fin origin between 10th–12th ray of second soft dorsal fin. Caudal fin rhomboidal, covered with small scales. Scales on snout, check and operculum cycloid, elsewhere ctenoid. Base of first dorsal fin, whole of second dorsal fin, pectoral fin and anal fin covered with small cycloid scales. Gill rakers lanceolate. Sagital otolith typical triangular shaped "johnius-type" with a tadpole shaped impression, caudal deepened as a hollow cone (Fig. 3). Gas bladder hammer-shaped with 12–15 pairs of lateral arborescent appendages (Fig. 4).

Coloration. In fresh condition, the body is grey with a silverish sheen and a bluish tinge, below pale whitish, the first dorsal fin is dark, and the second dorsal fin is grey.

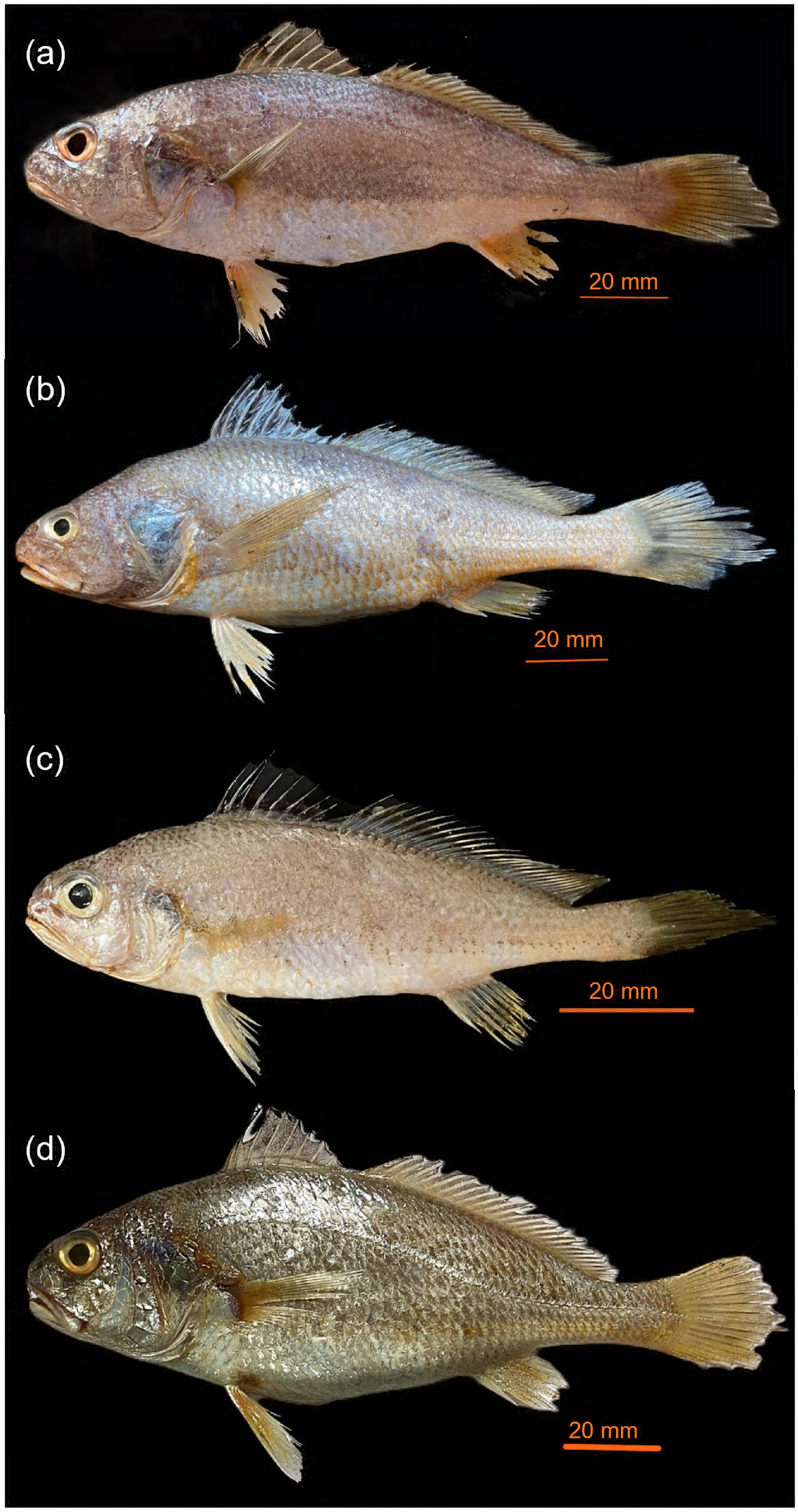

Figure 5. Photographs of specimens representing **a.** *J. borneensis*; **b.** *J. dussumieri*; **c.** *J. plagiostoma* and **d.** *J. medidentatus.* Scale bar: 20 mm.

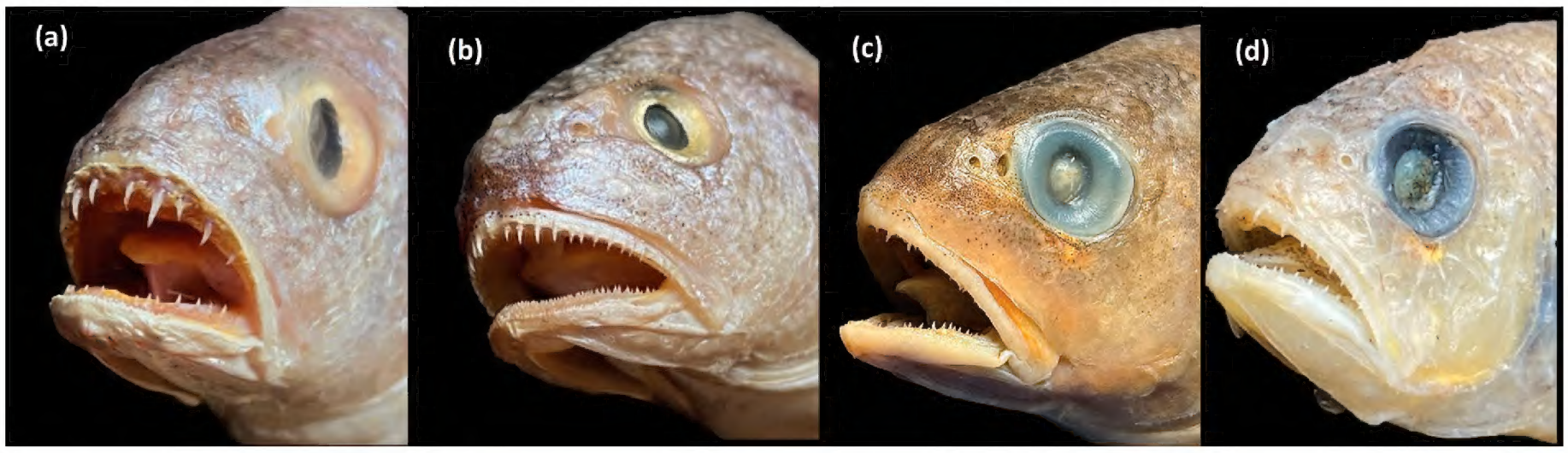

Figure 6. Photograph showing comparative teeth pattern of **a.** *J. borneensis*; **b.** *J. dussumieri*; **c.** *J. medidentatus* and **d.** *J. plagiostoma*.

Table 2. Morphometrics and meristics of *Johnius medidentatus* sp. nov. SE = standard error.

Variables	Holotype	Paratypes + non-types (n = 51)	Mean ± SE
Standard length (mm)	141	85–164	132.8 ± 2.5
% SL			
Body depth	30.5	27.5–35.2	30.0 ± 0.2
Head length	29.7	24.9–32.6	29.1 ± 0.2
Head depth	28.5	26.2–30.3	27.9 ± 0.1
Head width	16.1	14.5–18.0	16.0 ± 0.1
Pre-dorsal length	29.4	26.2–31.2	28.9 ± 0.1
Post-dorsal length	12.7	10.3–14.0	12.1 ± 0.1
Dorsal fin base length	57.0	53.9–63.9	58.6 ± 0.3
Pre-pectoral length	29.0	27.2–31.7	29.8 ± 0.2
Pectoral fin length	19.2	16.2–29.5	21.3 ± 0.3
Pelvic fin length	16.2	14.9–19.5	17.0 ± 0.1
Pre-pelvic length	31.7	27.6–34.6	30.8 ± 0.2
Pre-anal length	71.4	68.5–73.5	70.7 ± 0.2
Caudal fin length	19.3	18.2–26.4	21.5 ± 0.2
Caudal Peduncle length	23.6	19.3–25.1	22.8 ± 0.2
% HL			
Post orbital length	57.5	53.7–64.1	58.0 ± 0.3
Snout length	19.8	15.3–22.9	19.0 ± 0.2
Eye diameter	23.4	21.8–30.1	25.7 ± 0.3
Interorbital length	28.7	25.7–32.1	28.3 ± 0.2
Pectoral fin base length	17.8	14.9–20.5	17.5 ± 0.1
Pelvic fin base length	10.5	9.4–17.0	12.7 ± 0.2
First anal fin ray length	44.0	35.3–56.1	46.0 ± 0.7
Anal fin base length	29.3	27.7–40.9	32.2 ± 0.3
Caudal fin base length	39.4	35.2–45.7	40.0 ± 0.3
Least depth of caudal peduncle	32.9	29.0–38.0	32.6 ± 0.2
Second anal fin spine length	23.8	22.0–38.8	27.9 ± 0.5
Upper jaw length	45.5	43.6–54.7	48.4 ± 0.3
Lower jaw length	41.3	40.6–52.8	45.2 ± 0.3
Mouth gap distance	31.4	27.1–42.5	31.4 ± 0.3
Meristics			
Dorsal fin spine in first dorsal fin	10	9–10 (10)	–
Dorsal fin rays	28	25–30 (28)	–
Pectoral fin rays	17	14–18 (17)	–
Pelvic fin rays	5	5 (5)	–
Anal fin rays	7	7 (7)	–
Caudal rays	17	17 (17)	–
Lateral line scales	50	46–50 (49)	–
Scales above lateral line	6	6–7 (6)	–
Scales below lateral line	11	11–13 (12)	–
Upper gill raker	7	5–8 (7)	–
Lower gill raker	12	10–15 (13)	–
Total gill raker	19	17–24 (21)	–

Pectoral, pelvic, anal, and caudal fins pale yellow, with dusky spots and a few dusky spots on upper lips. In formalin specimens, slightly darker, dusky spots on the body and on the fins.

Etymology. The species is named "*medidentatus*" with reference to the moderate-size teeth in the inner row of the lower jaw (Latin origin, *medius* = middle or moderate; *dentatus* = toothed).

Distribution. This species has a wide distribution along the Indian Coastline: off Mumbai coast, Karnataka, Kerala coast, Tamil Nadu, Andhra Pradesh, Odisha, West Bengal; both from the east and west coasts of India.

Identification key to the genus *Johnius* (*Johnieops*) found in Indian waters

1 First pair of mental pores separated by symphysis, mental process present on lower jaw, scales below lateral line 9–11 ..... *J. plagiostoma* (Bleeker, 1850)
– First pair of mental pores not separated by symphysis, mental process on lower jaw absent, scales below lateral line 11–14 2
2 Snout pointed from the dorsal view, 1–2 pairs of strong anterior teeth present on the outer row of upper jaw, teeth on the inner row of lower jaw teeth much enlarged .....*J. borneensis* (Bleeker, 1851)
– Snout rounded from dorsal view, no anterior strong teeth present on the upper jaw, teeth in the inner row of lower jaw teeth weak to moderate in size 3
3 Teeth in the inner row of lower jaw enlarged but smaller in size, slightly projecting snout, eye diameter 15–22% HL..... ..... *J. dussumieri* (Cuvier, 1830)
– Teeth in the lower jaw enlarged but moderate in size, snout never projecting, eye diameter 21.8–30.1% HL..... ..... *J. medidentatus* Geenita et al., sp. nov.

Comparisons

The genus *Johnius* has been divided into two subgenera, *Johnieops* and *Johnius*, based on the pattern of teeth on the upper and lower jaw. The new species described herein comes under the subgenus *Johnieops*, i.e., having enlarged and spaced teeth in the outer row of the upper jaw and enlarged teeth on the inner row of the lower jaw (Lal Mohan et al. 1984). The new species differs from all congeners found in Indian waters but shares slightly similar body morphology with *J. plagiostoma* (Fig. 5). *Johnius medidentatus* can be easily differentiated from *J. plagiostoma* by having first pair of mental pores in a false pit (vs. separated by symphysis), absence of a mental process at lower jaw (vs. present), presence of moderately enlarged teeth in inner row of lower jaw (vs. well enlarged teeth), higher number of scales below the lateral line (11–13, mode 12 vs. 9–11, mode 10) and fewer number of total gill rakers (17–24, mode 21 vs. 22–26, mode 25) (see Table 3). It differs from *J. borneensis* by having a rounded snout (vs. pointed from dorsal view) (Hanafi et al. 2022, 2024; Sasaki 2022), absence of strong anterior teeth in the outer row of the upper jaw (vs. present) (Chao et al. 2019; Sasaki 2022), moderately enlarged teeth in the inner row of the lower jaw (vs. well enlarged teeth), relatively shorter snout (15.3–22.9% HL vs. 20.4–26.2% HL), higher number of gill raker in the lower limb of the first gill arch (10–15, mode 13 vs. 9–13, mode 11), higher number of total gill raker (17–24, mode 21 vs. 14–21, mode 17) (see Tables 3, 4). It differs from *J. dussumieri* in having larger eye (21.8–30.1% HL vs. 15.7–22.4% HL), interorbital area not flattened (vs. flattened), longer preanal length (68.5–73.5% SL vs. 59.75–69.94% SL) (see Table 4). Out of these three species found in Indian waters, *J. dussumieri* have comparatively smaller enlarged teeth in the inner row of the lower jaw, the other two, i.e., *J. borneensis* and *J. plagiostoma* have prominent and larger enlarged teeth in the inner row of the lower jaw. In comparison to all three, our new species has moderately sized teeth, larger than *J. dussumieri* but relatively smaller than *J. plagiostoma* and *J. borneensis* (Fig. 6).

J. medidentatus sp. nov. differs from *J. distinctus* (Tanaka, 1916) from Japan, China and Taiwan most prominently by absence of conspicuous white streak along the lateral line (vs. present), lesser number of scales above lateral line (6–7 vs. 7–11), longer upper jaw length (43.6–54.7% HL vs. 38–43% HL) (Sasaki 1999). From *Johnius dorsalis* (Peters,1855) which is distributed from South Africa, East Africa to Madagascar, it differs by having shorter interorbital length (25.7–32.1% HL vs. 29–39% HL), though slightly overlapping but never exceeded 32%, longer upper jaw length (43.6–54.7% vs. 34–46%), first spinous dorsal fin naked (vs. fully covered with small scales) (Sasaki 1997, 1999). The new species differs from *J. novaeguineae* (Nichols, 1950) from New Guinea and Northern Australia by having three pair of mental pores, and first pair not separated by symphysis (vs. one pair only and separated by symphysis), lesser scales above lateral line (6–7 vs. 8–9), lesser scales below lateral line (11–13 vs. 14–19), lesser upper gill raker count (5–8 vs. 8–11), lesser lower gill raker count (10–15 vs. 16–18), lesser number of total gill raker (17–24 vs. 24–29), larger eye (21.8–30.1% HL vs. 11–16% HL), smaller interorbital length (25.7–32.1% HL vs. 33–42% HL) (Trewavas 1977; Sasaki 1999). It differs from *J. pacificus* Hardenberg, 1941, from the northern Pacific coast of New Guinea by having larger eyes (21.8–30.1% HL vs. 16–23% HL), longer upper jaw length (43.6–54.7% HL vs. 39–45% HL). Even though there is slight overlapping of the morphometric characters, *J. pacificus* has a restricted distribution and is known to occur only along the coast of New Guinea (Sasaki 1999; Froese and Pauly 2024). It differs from *J. philippinus* Sasaki, 1999 from Philippines by having longer upper jaw length (43.6–54.7% HL vs. 37–44% HL), lesser snout length (15.3–22.9% HL vs. 24–29% HL) and appendages on the swim bladder well-branched (vs. poorly branched) (Sasaki 1999).

Table 3. Frequency distribution of selected meristic data of *Johnius medidentatus* sp. nov., *Johnius borneensis*, *Johnius plagiostoma* and *J. dussumieri* from Indian region.

Lower gill raker														
Counts	n	9	10	11	12	13	14	15	16	17				
J. medidentatus sp. nov.	52	0	2	0	8	26	14	2	0	0				
J. borneensis	55	1	8	23	15	8	0	0	0	0				
J. plagiostoma	30	0	0	0	0	0	1	14	11	4				
J. dussumieri	44	0	0	2	5	7	14	14	2	0				
Total gill raker														
Counts	n	14	15	16	17	18	19	20	21	22	23	24	25	26
J. medidentatus sp. nov.	52	0	0	0	1	1	8	10	15	14	2	1	0	0
J. borneensis	55	1	1	1	19	13	15	5	0	0	0	0	0	0
J. plagiostoma	30	0	0	0	0	0	0	0	0	1	5	10	12	2
J. dussumieri	44	0	0	0	0	3	4	5	5	10	7	10	0	0
Scales below lateral line														
Counts	n	9	10	11	12	13								
J. medidentatus sp. nov.	52	0	0	10	33	9								
J. borneensis	55	0	0	0	5	50								
J. plagiostoma	30	1	26	3	0	0								
J. dussumieri	44	0	0	18	21	5								

Table 4. Comparison table of selected morphometric and meristic characters of the new species with its congeners from the Indian region.

	***J. dussumieri* (n = 44)**	***J. plagiostoma* (n = 30)**	***J. borneensis* (n = 55)**	***J. medidentatus* sp. nov. (n = 52)**
Standard length (mm)	95–163	86–108	68–204	85–164
Measurement (% SL)				
Body depth	27.2–33.4 (30.4 ± 0.2)	27.2–32.2 (30.0 ± 0.2)	25.0–39.2 (30.2 ± 0.3)	27.5–35.2 (30.0 ± 0.2)
Head length	26.1–32.1 (29.8 ± 0.2)	26.4–30.5 (28.4 ± 0.2)	29.1–33.3 (31.3 ± 0.1)	24.9–32.6 (29.1 ± 0.2)
Head width	15.4–20.6 (18.1 ± 0.1)	14.3–17.8 (16.2 ± 0.2)	14.1–19.0 (17.1 ± 0.2)	14.5–18.0 (16.0 ± 0.1)
Pre-anal length	59.8–69.9 (66.7 ± 0.3)	66.2–71.8 (68.9 ± 0.3)	64.7–72.4 (69.1 ± 0.2)	68.5–73.5 (70.7 ± 0.2)
Measurement (% HL)				
Post orbital length	59.4–68.6 (63.5 ± 0.3)	49.1–57.7 (53.8 ± 0.4)	49.8–61.9 (55.1 ± 0.3)	53.7–64.1 (58.0 ± 0.3)
Snout length	12.8–22.8 (18.1 ± 0.3)	15.4–21.3 (18.3 ± 0.3)	20.4–26.2 (23.2 ± 0.1)	15.3–22.9 (19.0 ± 0.2)
Eye diameter	15.7–22.4 (19.0 ± 0.3)	27.1–32.8 (29.0 ± 0.3)	19.5–27.5 (24.1 ± 0.2)	21.8–30.1 (25.7 ± 0.3)
Interorbital length	29.5–38.5 (33.3 ± 0.4)	28.4–33.3 (31.0 ± 0.2)	23.3–30.6 (26.2 ± 0.2)	25.7–32.1 (28.3 ± 0.2)
Caudal fin base length	32.2–46.1 (38.5 ± 0.4)	34.7–41.2 (36.7 ± 0.3)	30.2–40.7 (35.1 ± 0.4)	35.2–45.7 (40.0 ± 0.3)
Least depth of caudal peduncle	26.1–39.8 (32.4 ± 0.4)	29.1–36.5 (32.4 ± 0.3)	25.1–33.33 (29.0 ± 0.3)	29.0–38.0 (32.6 ± 0.2)
Upper jaw length	39.2–48.2 (43.8 ± 0.3)	48.7–55.7 (52.7 ± 0.3)	41.3–51.4 (45.2 ± 0.3)	43.6–54.7 (48.4 ± 0.3)
Lower jaw length	35.6–44.7 (40.5 ± 0.3)	45.9–52.8 (49.4 ± 0.3)	36.0–49.2 (41.6 ± 0.4)	40.6–52.8 (45.2 ± 0.3)
Second anal fin spine length	20.0–35.4 (28.7 ± 0.4)	27.3–35.5 (31.7 ± 0.4)	23.2–38.7 (30.6 ± 0.6)	22.0–38.8 (27.9 ± 0.5)
Mouth gap distance	27.3–36.4 (31.3 ± 0.3)	27.1–35.8 (32.2 ± 0.3)	25.0–35.7 (30.4 ± 0.3)	27.1–42.5 (31.4 ± 0.3)
Counts				
Dorsal fin rays	24–30 (27)	27–32 (29)	27–29 (28)	25–30 (28)
Scales above lateral line	5–7 (5)	5–6 (6)	6–8 (7)	6–7 (6)
Scales below lateral line	11–13 (12)	9–11 (10)	11–13 (13)	11–13 (12)
Upper gill raker	4–8 (7)	6–9 (8)	3–7 (6)	5–8 (7)
Lower gill raker	11–16 (15)	14–17 (15)	9–13 (11)	10–15 (13)
Total gill raker	18–24 (22)	22–26 (25)	14–21 (17)	17–24 (21)

Molecular analysis

A final aligned sequence length of 551 bp after trimming the gaps at the ends were used in molecular analysis. In the maximum likelihood phylogenetic tree, individuals of *Johnius medidentatus* formed a distinct cluster with high bootstrap support (>80%) (Fig. 7). This clade was positioned as a sister group to *J. borneensis* from India and other regions with a 10.1% genetic divergence in K2P value. The new species exhibits on an average 8.8% genetic divergence with *J. distinctus* followed by *J. dussumieri* (9.2%), *J. novaeguineae* (15.9%) and *J. plagiostoma* (21.9%). Further, the new species exhibited intraspecific divergence value of 0.2% (Table 5).

Discussion

Sciaenids of the genus *Johnius* can be distinguished primarily by the hammer-shaped swim bladder and the triangular shape of the sagittal otolith. The genus contains cryptic species and identification using integrative tools is necessary. In Indian waters, earlier attempts to differentiate sciaenids were mainly based on morphological

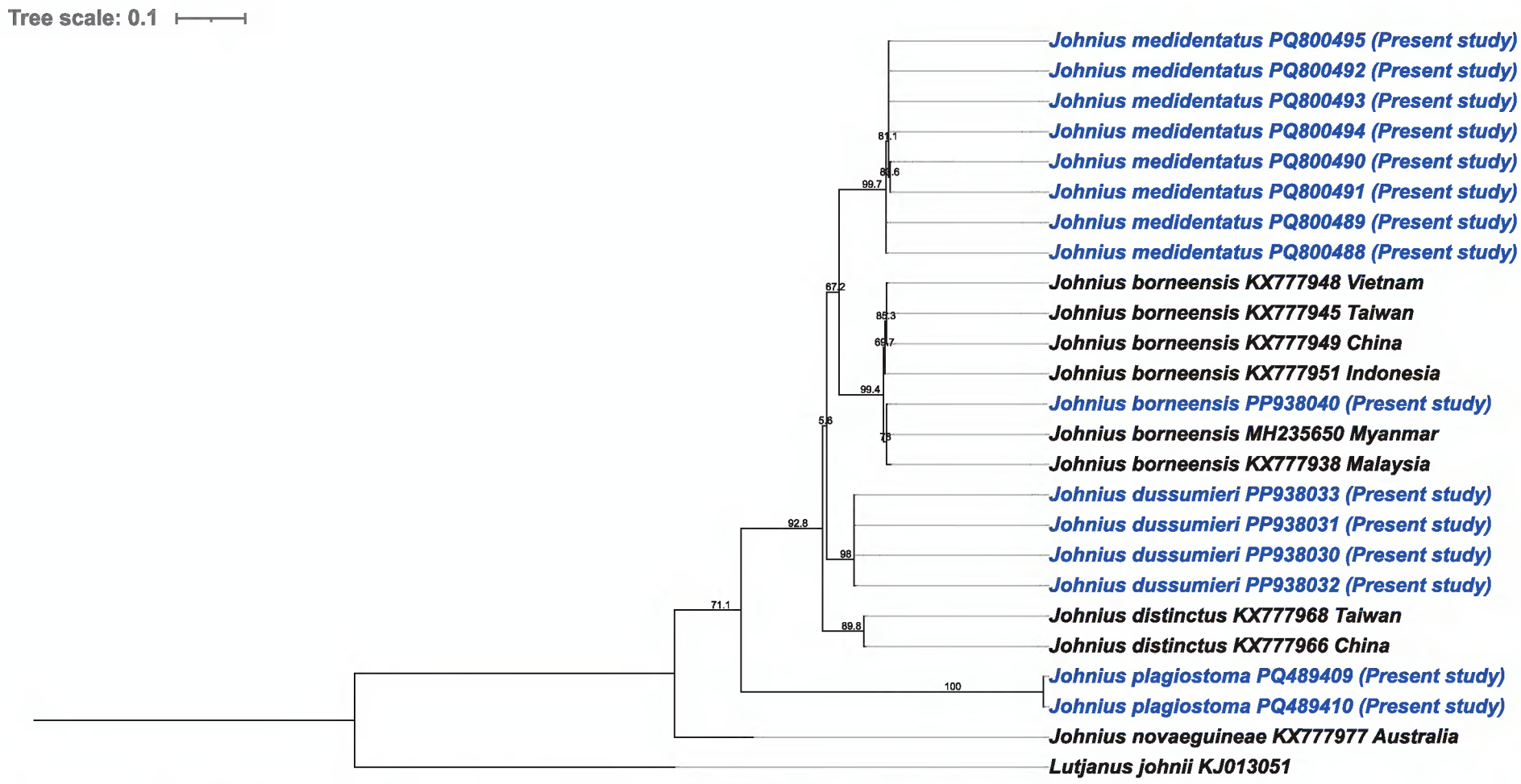

Figure 7. Maximum Likelihood tree of the new species with its closely related species plotted with HKY+F+G4 model with 1000 bootstrap replications based on partial COI gene sequences. Numbers at nodes indicate bootstrap support values (>70).

Table 5. Average pair-wise genetic distance values (Kimura 2-paramter model) among the closely related selected species of *Johnius* (*Johnieops*). The values in the diagonal cells represents intraspecific genetic distance values.

	1	2	3	4	5	6
J. medidentatus sp. nov. (1)	0.002					
J. borneensis (2)	0.101	0.000				
J. dussumieri (3)	0.092	0.082	0.000			
J. plagiostoma (4)	0.219	0.209	0.210	0.000		
J. distinctus (5)	0.088	0.104	0.081	0.204	0.001	
J. novaeguineae (6)	0.159	0.167	0.161	0.202	0.162	0.00

and classical taxonomy tools without molecular intervention (Lal Mohan 1969, 1981; Chakraborty 1988; Talwar 1995, Kumar et al. 2012; Kumari et al. 2021) except for a few studies (Lakra et al. 2007, 2009). Earlier studies reported two species under the subgenus *Johnieops* in Indian waters (Lal Mohan 1981; Talwar 1995). With the confirmed occurrence of *J. plagiostoma* in Indian waters during the present study, along with the new species described herein, the total number of *Johnius* (*Johnieops*) species from India is now documented as four. The new species has a wide distribution in Indian waters like those of its congeners, *J. dussumieri* and *J. borneensis*, as it is distributed along both the east and west coasts of India. *J. plagiostoma* is only known from the Bay of Bengal in the Indian region (Parenti 2020), with the first confirmed record from Indian waters from this present study. Most of the other species of *Johnius* (*Johnieops*) found in the world have restricted distribution viz., *J. distinctus* from Northwest Pacific, *J. novaeguineae*, *J. philippinus* and *J. pacificus* from Western Central Pacific, *J. dorsalis* from Western Indian Ocean, Kenya to South Africa and Madagascar (Froese and Pauly 2024). This species was caught along with other sciaenids, and since all *Johnius* have similar external morphological features, it remained undiscovered. The new species can be differentiated from its Indian congeners based on the different combination of morpho-meristic characteristics (see comparison section). Also, the new species is clearly distinguishable from its Indian congeners by having a different body shape and the moderate size pattern of teeth in the inner row of the lower jaw (see Figs 5, 6). The comparison of the genetic distances of the generated and available sequences from NCBI Genbank has also shown distinctiveness with very high value, which differentiates the new species from other *Johnius*. All the sciaenid has differential preferences by people along the Indian coastline, and it was observed that this species, though earlier unrecognized and confused in identity with other *Johnius* species, was found to be consumed domestically and has commercial importance like other sciaenids.

Comparative material

Johnius dorsalis: Africa • 2, [132–156 mm SL], syntypes of *C. dorsalis* (photograph); Quillimane, Mozambique, 18°S; ZMB 896.

Johnius borneensis: India • 1, 151 mm SL; Versova fish landing centre, Mumbai, Maharashtra; 19°08.63'N, 72°48.23'E; 1 Dec. 2023; K. Geenita leg.; CF1MH0096 Indonesia • 1, 138.5 mm SL, holotype of *Corvina goldmanni* (photograph); Soengi Puan, (Soengi-Rass) Batjan; RMNH 5977 • 1, 80.3 mm SL, holotype of *Otolithus borneensis* (photograph); Bandjarmasin, Borneo; RMNH 5980.

Johnius dussumieri: India • 1, 133 mm SL; Sasson Dock, Mumbai, Maharashtra; 18°54.59'N, 72°49.56'E;

14 Feb. 2023; K. Geenita leg.; CF1MH0097 • 1, 87 mm SL; Kalamukku Fishing Harbour, Puthuvype, Kochi, Kerala; 9°59.03'N, 76°14.56'E; 30 Mar. 2023; K. Geenita leg.; CF1KL0098 • 2, 99–122 mm SL; Versova fish landing centre, Mumbai, Maharashtra; 19°08.63'N, 72°48.23'E; 8 Sept. 2023; K. Geenita leg.; CF1MH0099–CF1MH0100 • 1, 135 mm SL, lectotype of *Sciaena osseous*; Malabar Coast; ZSI F13040 • 1, 102 mm TL, holotype of *Wak menoni*; Diamond harbor, Hooghly estuary, West Bengal; ZSI F6136/2 • 7, 86–108 mm, paratypes of *Wak menoni*; Diamond harbor, Hooghly estuary, West Bengal; ZSI F6137/2 • 3, 111–113 mm SL, syntypes of *Corvina sina* (photograph); Puducherry and Malabar; MNHN 7521 • 1, 156 mm SL, syntypes of *C. sina* (photograph); Puducherry and Malabar; MNHN 7633 • 1, 145 mm SL, syntype of *C. dussumieri* (photograph); Malabar; MNHN 7614.

Johnius plagiostoma: India • 2, 92–102 mm SL; Diamond harbour, West Bengal; 22°11.39'N, 88°11.08'E; 20 Mar. 2023; K. Geenita leg.; CF1WB011–CF1WB0112.

Authors' contribution

KG collected, identified, examined the specimens, performed molecular analysis and overall prepared the manuscript. APK helped in molecular analysis and revising the manuscript. SB helped with manuscript preparation and revising the manuscript. SMD contribute to the preparation and revision of the manuscript including data interpretation. AKJ provided overall guidance and supported the work. All authors read and approve the final version of the manuscript.

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Supplementary material 1

Pairwise K2P genetic distance values of COI gene of the new species with other selected species of *Johnius*

Authors: Keisham Geenita, Annam Pavan-Kumar, Shashi Bhushan, Sukham Monalisha Devi, Ashok Kumar Jaiswar

Data type: xls

Explanation note: This file presents the genetic distance values (K2P) of the newly described species in comparison with available sequences of *Johnius* from the NCBI database. The dataset primarily includes sequences from the subgenus *Johnieops*, with one representative from the subgenus *Johnius*, and an outgroup for reference. The genetic distance analysis aims to highlight the genetic divergence and support the taxonomic placement of the new species within the genus *Johnius*.

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Link: https://doi.org/10.3897/zse.101.153172.suppl1